Progress in Colour Studies 2012: List of abstracts

Keynote lecture

Prehistoric Colour Semantics: a Contradiction in Terms

C. P. **Biggam**, University of Glasgow, UK

The term *prehistory* indicates a time before written records, so how can we possibly understand the colour systems of prehistoric peoples? This paper will attempt to make a case, in relation to the distant past of the Indo-European family, that it is possible to provide a reasonable 'reconstruction' of certain concepts in languages for which there have been no living native speakers for many centuries. The argument will be presented that there are several disparate strands of evidence, all of them fragmentary, which can be brought together and viewed against the background of certain techniques and hypotheses employed by anthropologists, historical linguists, psychologists and archaeologists. The discussion will include indications, hints and evidence from the following: the colour systems of modern languages; colour category prototypes; the known techno-economic advances of prehistoric peoples; the identification of cognates in related languages; linguistic 'primitives'; relative chronology; relative basicness; and the earliest Indo-European texts. It is hoped that the paper will provide a convincing argument that, because colour concepts can be approached from so many directions, this field provides one of the best chances we have to glimpse the workings of prehistoric minds.

Blackguards, *Whitewash*, *Yellow Belly* and *Blue Collars*: Metaphors of English colours

[oral presentation]

Marc **Alexander**, Wendy **Anderson**, Ellen **Bramwell**, Flora **Edmonds**, Carole **Hough** and Christian **Kay**, University of Glasgow, UK

The *Historical Thesaurus of English*, published in 2009 as the *Historical Thesaurus of the Oxford English Dictionary*, contains the recorded vocabulary of the language from Old English to the present day. The full Thesaurus database contains 800,000 meanings and is unique in both its historical coverage and in the detailed semantic information captured by its scheme of classification. Following its completion, the Thesaurus's potential to enable experimental work in the study of the history of English has been explored by a range of scholars from the UK and abroad. This paper continues that work as part of the AHRC-funded *Mapping Metaphor* project, about to start at the University of Glasgow, which will use Thesaurus data to examine the distribution of metaphors across time in English. By investigating possible metaphorical links between concepts, carried out through an examination of areas of significant lexical overlap between distant Thesaurus categories, the project aims to examine the operation of metaphor in the history of English, using the data encoded in the language system and evidenced in the Thesaurus. This paper will therefore focus on the figurative use of colour words throughout the Thesaurus, empirically examining those metaphorical relationships between colour and a range of other semantic domains which are encoded in the recorded vocabulary of the English language.

Kay, Christian, Jane Roberts, Michael Samuels and Irené Wotherspoon (eds). 2009. *Historical Thesaurus of the Oxford English Dictionary*. Oxford: Oxford University Press.

The Spread of *Red* in the Historical Thesaurus of English
[oral presentation]

Marc **Alexander**, Flora **Edmonds** and Christian **Kay**, University of Glasgow, UK

The basic colour category RED and its exponents occupies an important place in the development of colour vocabulary, whether in the evolution of colour perception (Humphrey 1976), infant language learning (Pitchford 2011), or the history of particular languages (Uusküla 2011). This paper will focus on the development of the RED category in English using data from the *Historical Thesaurus of the Oxford English Dictionary* (HTOED: Kay et al. 2009), which lists synonyms from the earliest English records until the present day. Comparison with other English BCCs shows that RED has by far the largest number of exponents over history and the steepest increase in lexis in the modern period. It shares with WHITE the largest number of subdivisions of meaning in the HTOED taxonomy, enabling concepts such as 'degrees of redness' and 'typical exemplars of redness' to be explored. Searches on other areas of meaning, such as the nomenclature of the natural world and metaphorical uses of exponents of RED, help to place the category in its cultural and interdisciplinary context and explain its longstanding salience for English speakers.

Biggam, Carole, Carole Hough, Christian Kay and David Simmons (eds). 2011. *New Directions in Colour Studies*. Amsterdam: Benjamins.

Humphrey, Nicolas. 1976. "The Colour Currency of Nature" in Tom Porter and Byron Mikellides (eds) *Colour for Architecture*, 95-98.

Kay, Christian, Jane Roberts, Michael Samuels and Irené Wotherspoon (eds). 2009. *Historical Thesaurus of the Oxford English Dictionary*. Oxford: Oxford University Press.

Pitchford, Nicola J., Emma E. Davies and Gaia Scerif. 2011. "Look and learn: Links between colour preference and colour cognition" in Biggam et al., 377-388.

Uusküla, Mari. 2011. "Terms for Red in Central Europe: an Areal Phenomenon in Hungarian and Czech" in Biggam et al., 147-156.

Attention Modulates Hemispheric Lateralisation of Categorical Colour Search: An alternative account for 'Lateralised Whorf'
[oral presentation]

James **Alvarez**, Alexandra **Clifford**, Amanda **Holmes** and Anna **Franklin**
University of Surrey, UK

Several studies have found a greater influence of colour categories on visual search when targets are lateralised to the right visual field-left hemisphere (RVF-LH) than the left visual field-right hemisphere (RVF-LH: e.g., Gilbert et al., 2005, but see also Brown et al., 2011). This effect has been attributed to 'Whorfian' (linguistic) processes, in part due to the language dominance of the LH. However, here we propose that the effect is due to a LVF-RH attentional bias during chromatic visual search, perhaps due to increased RH specialisation for colour detection (Sasaki et al. 2007). Our model, informed by signal detection theory, suggests that reduced attention slows difficult search more than easy search, accentuating differences in the

discriminability of same- and different-category colours in the less attended RVF-LH. In support of this model, a series of experiments establish that when participants' attention is biased to the RVF, the 'category effect' switches to the less attended LVF-RH, and the LVF-RH bias arises independently of linguistic colour boundaries. We discuss how the model could also account for both the RH 'category effect' in infants (e.g., Franklin et al., 2008), and the lack of hemispheric lateralisation in other studies (Witzel & Gegenfurtner, 2011).

Brown, A. M., Lindsey, D. T., and Guckes, K. M. (2011). *Journal of Vision*, 11(12).
Franklin, A., Drivonikou, G. V., Bevis, L., Davies, I. R. L., Kay, P., and Regier, T. (2008). *PNAS*, 105(9):3221–3225.
Gilbert, A. L., Regier, T., Kay, P., and Ivry, R. B. (2006). *PNAS*, 103(2):489–494.
Sasaki, H., Morimoto, A., Nishio, A., and Matsuura, S. (2007). *Brain and Cognition*, 64(3):282–289.
Witzel, C. and Gegenfurtner, K. R. (2011). *Journal of Vision*, 11(12).

Beyond Basicness: Conceptual and sociolectal factors in the use of basic colour terms in advertising

[oral presentation]

Alena **Anishchanka**, Dirk **Speelman** and Dirk **Geeraerts**, University of Leuven, Belgium

The proposed analysis addresses language-internal variation in color categorization, focusing on the conceptual and contextual factors that determine the preference for basic or non-basic color terms (BCT) in modern American advertising. The study brings together two lines of research in color semantics, i.e. the color categorization studies in the Berlin and Kay tradition focusing on the referential meanings of the basic color terms and qualitative analyses of color words in advertising discourse. The latter predominantly explore the evocative potential of color words and often suggest non-popularity of basic color terms in this context. From a usage-based perspective this raises the question whether the generalizations made in BCT studies can be applied beyond the most salient color words, and how color terms behave in real-life usage contexts such as advertising.

Following the multivariate model of semantics (Geeraerts et al. 1994, Geeraerts & Speelman 2010), we propose a quantitative onomasiological analysis of the variation in the usage of BCT in advertising. The study is based on an extensive self-compiled corpus of color names and color samples (over 75 000 observations) used by US manufacturers for online marketing in four product categories (automobiles, clothing, make-up, and house paints). In the first series of analyses, we use univariate and bivariate tests to explore the individual effects of conceptual, sociolectal and linguistic factors in the usage of BCT. At the second stage, we apply multiple logistic regression to reveal the interactions between the different factors. The preliminary results suggest that conceptual factors (number and diversity of colors per product) give better prediction of variation in the usage of BCT across the four product categories. Whereas sociolectal factors (prestige status of the brand, country of origin, product sub-category) have a more fine-grained effect and are more relevant for variation within one product category.

Geeraerts, D., Grondelaers, S. and P. Bakema, 1994. *The Structure of Lexical Variation. Meaning, Naming, and Context*. Berlin: Mouton de Gruyter.

Geeraerts, D. and D. Speelman. 2010. Heterodox concept features and onomasiological heterogeneity in dialects. In G. Kristiansen, D. Geeraerts and Y. Peirsman (eds.), *Advances in Cognitive Sociolinguistics*. Berlin: Mouton de Gruyter, pp.23-41.

Lighting up Shakespeare: The metamerism of Jacobean stage lighting using LED technology

[oral presentation]

Emma **Armstrong**, Renfrewshire Arts and Museums, UK

There has been significant research into the history of Shakespeare's stage. More recently, research has been applied to Jacobean stage lighting in its exact form using traditional materials and techniques[1]. However, in this form, it is almost unusable due to health and safety and modern day factors, therefore creating a need for an alternative method to achieve a traditional style. *Lighting up Shakespeare* is presented in three subsections; accurate replication of the Jacobean stage, the use of light emitting diodes (LEDs) to achieve a metamer (different spectral distributions that are perceived as identical colours) to traditional tallow candles and the creation of ambience and "flicker".

Experiments were performed using twenty subjects to visually colour match combinations of LEDs to the tallow candle. Combinations of Orange White Green (OWG) and Red, Green, Blue (RGB) were used. The candle, RGB, and OWG combinations were tested on a spectroradiometer. A comparison of these results is presented, as is an analysis of the emotional and psychosomatic nature of ambience and flicker which was investigated through a combined study of flame dynamics and human reaction.

Observational experiments results varied wildly particularly with orange and green in the OWG combination. A discussion in to these findings follows along with details from spectroradiometer readings, the difficulties in the mono-chromaticity of LEDs and how a true metamer might be achieved with further research.

[1] White, Martin (2007) Artificial Lighting in the early modern English Commercial Playhouse, Available: http://www.bristol.ac.uk/drama/jacobean/project1.html last accessed 26th October 2011.

Personality and Gender-Schemata Contributions to Colour Preferences

[oral presentation]

Valérie **Bonnardel**, University of Winchester, UK, and National Institute of Design, India, David **Bimler**, Massey University, New Zealand, Jennifer **Brunt**, University of Winchester, UK, Laura **Lanning,** University of Winchester, UK and Chihiro **Sakai,** University of Winchester, UK

Even when subject sex and culture are taken into account, a great deal of variation remains in individual patterns of colour preference. We examined some personal factors that possibly contribute to this variation. A three-way comparison task was used to elicit preferences among

16 hues from 120 UK subjects and 43 Japanese subjects, who also provided gender-identification scores with the Bem Sex Role Inventory and five personality scales with the International Personality Item Pool questionnaire. In line with trends reported previously, group averages for UK males and females agreed on one preference peak for Blue and Blue-Green hues, but diverged elsewhere in the colour circle, where females showed a preference – absent in the male group – for purple hues over oranges and yellows. Corresponding trends emerged in the correlations between hue preferences and the Masculinity and Femininity gender-identification scores. . All subject groups' preferences were influenced by stimulus saturation. Of the personality scales, Neuroticism had the greatest effect on hue preferences, with Openness and Extraversion also important. Applying factor analysis to the data and retaining four prototype preference patterns, loadings on these factors correlated instructively with the personal qualities. These associations may reflect cultural standards: in contrast, Japanese subjects displayed very little male / female difference, and weaker effects from the personal factors.

The Grue Category in Middle Eastern Languages
[oral presentation]

Alexander **Borg**, Ben-Gurion University of the Negev, Israel

Linguistic colour research in the Berlin & Kay paradigm has tended to present colour systems designating the *blue-green* continuum by one distinctive colour name (often referred by the technical term GRUE) as a typological cognitive trait pertaining to a variety of unrelated languages. Ongoing lexicographical work taking within its ambit language use in Arabic- and Aramaic-speaking communities in various parts of the Middle East has brought to light the existence of a regionally defined green-blue category noted among sedentarized Bedouin tribesmen in Southern Sinai, in rural varieties of Lebanese Arabic, and in different Neo-Aramaic vernaculars. This study pleads for a more elaborate research agenda highlighting cultural constraints on colour cognition.

Philosophy and the Colour Categories
[oral presentation]

Mazviita **Chirimuuta**, University of Pittsburgh, USA

In the philosophical debate over the reality (or otherwise) of colour, a key question has been whether certain features of subjective colour experience rule out the identification of colours with objective physical properties. The debate has concentrated on the uniqueness of hues and opponency relations (Hardin 1988, Byrne & Hilbert 2003). The fact that colour perception is categorical has received relatively less attention within philosophy, though Matthen (2005) has argued that the perceiver dependent nature of colour categories is compatible with his version of colour realism.

In this paper I argue that there is a complex lesson to be learned from colour categorisation. It is not simply that colours can be equated with our categories, and are therefore subjective; or that categorisation is merely a distraction from the essential business of colour perception, which is to recover objective physical properties. Rather, categorisation should be thought of as a "warping" of perceptual space which can nevertheless serve the purposes of discrimination and re-identification of objects; yet, at the same time, certain abstractions of physical stimulus properties made possible through categorical perception serve purposes in communication which are orthogonal to any purely representational goals in perception. Such perceptual abstractions have been studied extensively in speech perception and I discuss the relevance of this literature to colour perception. I argue that any equivocation over the subjectivity or objectivity of categorical perception can best be understood in terms of the "narcissism" of sensory systems (Akins 1996), whereby all perceptual representations are shaped by the various needs and interests of the perceiver.

Akins, K. A. (1996). " Of Sensory Systems and the "Aboutness" of Mental States." Journal of Philosophy 93(7): 337-72.

Byrne, A. and D. R. Hilbert (2003). "Color realism and color science." Behavioral and Brain Sciences 26: 3-64.

Hardin, C. L. (1988). Color for Philosophers. Indianapolis, Indiana, Hackett.

Matthen, M. (2005). Seeing, Doing and Knowing: A Philosophical Theory of Sense Perception. Oxford, Oxford University Press.

Neural Correlates of Acquired Categorical Perception of Colour

[oral presentation]

Alexandra **Clifford**, University of Surrey, UK, Anna **Franklin**, University of Surrey, UK, Amanda **Holmes**, Roehampton University, UK, Vicky G. **Drivonikou**, University of Surrey, UK, Emre **Özgen**, Bilkent University, Turkey, and Ian R. L. **Davies**, University of Surrey, UK

Category training can induce categorical perception (CP) of colour, whereby colours spanning a newly learned category boundary are discriminated more easily than equivalently spaced colours from within a newly learned category. For example, Özgen and Davies (2002) trained subjects to divide green into two new categories and found acquired CP on a successive same-different task. They interpreted these findings as evidence that category training had changed perception. Although improvements in same-different performance could be based on perceptual change, they could also be based on memory or decisional effects. Here we replicate Özgen and Davies' category training, but test for CP using Event-related potentials (ERPs) to clarify the mechanisms underlying acquired colour category effects. ERPs were recorded during a visual oddball task where standard and deviant colours from the same or different novel categories were presented. ERPs were recorded for a test group who were trained on these novel categories and for an untrained control group. Category effects were only found for the test group on the trained region of colour space. Additionally, acquired CP only occurred during

post-perceptual stages of processing, unlike CP for established colour categories, which involves perceptual and post-perceptual mechanisms (Holmes, Franklin, Clifford & Davies, 2009). The current investigation provides new evidence for the involvement of cognitive processes in acquired colour CP and suggests that CP of this kind can exist independent of early perceptual mechanisms. These findings have implications for debates about the origin and nature of colour categories.

Holmes, A., Franklin, A., Clifford, A., & Davies, I. R. L. (2009). Neurophysiological evidence for categorical perception of color. *Brain and Cognition, 69*, 426–434.

Özgen, E., & Davies, I. R. L. (2002). Acquisition of categorical color perception: A perceptual learning approach to the linguistic relativity hypothesis. *Journal of Experimental Psychology: General, 131*(4), 477-493.

Perceptual and Categorical Judgements of Colour Similarity

[oral presentation]

Jules **Davidoff**, University of London, UK

Consideration is given to the tasks that make judgements of colour similarity based on perceptual similarity rather than categorical similarity. A most important aspect of categorical similarity is known as Categorical Perception (CP) where colours from the same category look more similar than would be predicted from their perceptual similarity. As most studies on CP have used the Munsell metric that attempts to equate perceptual similarity between samples, it has been argued to be paradoxical that they can also be seen categorically. The paradox is resolved by proposing the two ways of seeing colour differences (i.e., perceptual or categorical). Studies will be reported that show that categorical similarity (and hence CP) is our default procedure but only in implicit judgements of colour difference.

Current Status of Colour Categorization Research: The recent past

[oral presentation]

Don **Dedrick**, University of Guelph, Ontario, Canada

In a book published in 1998 (p.5) Dedrick wrote that

"Berlin and Kay have continued to write about colour language. Related work by other anthropologists, linguists, psychologists, vision scientists, and neuroscientists has enriched — or excoriated — the position originally stated in Basic Color Terms (Berlin & Kay, 1969). The universalist tradition in colour naming research has, as a consequence, changed considerably over the past 30 years."

The decade plus since this was written has seen further and explosive growth in colour categorization research (and some doubt about the validity of the "universalist tradition"). While much recent is along lines that would be familiar to someone looking at the state of the art at the turn of the 21st century, other work has expanded the field of research into new, or newly sophisticated domains. There is, for instance, a developing literature using computational models to simulate the process of colour category acquisition and application. In the spirit of Eleanor Rosch, there has been a highly intensive "anthropological psychology" studying in detail the categorization of colour by aboriginal people, *in situ*. The role of language regions in the brain and their role in colour categorization has been studied using fMRI. And the comparative method in cognitive science has seen a striking application in contemporary research which, over the last decade, has allowed us to compare and contrast research on infants, adults, non human primates, non Western populations, and machines. The purpose of this paper is to introduce non specialists to the range as well as the interconnections in this research, and to highlight what might be thought to be problematical, outstanding issues, going forward.

Dedrick, D. (1998). Naming the rainbow: colour language, colour science, and culture. Kluwer.
Berlin, B. & Kay, P. (1969). Basic color terms. University of California Press.

Black, White and Red: The basicness of Berwickshire watercolours
[poster presentation]

Leonie **Dunlop** and Carole **Hough**, University of Glasgow, UK

Scottish Toponymy in Transition: Progressing the County Surveys of Scotland is a research project at the University of Glasgow funded by the Arts and Humanities Research Council from May 2011 to June 2014. The aims are to produce place-name surveys for the historical counties of Clackmannanshire and Kinross-shire and for Menteith, and to initiate work on Ayrshire and Berwickshire.

Bordering on northern England, Berwickshire formed part of Anglo-Saxon Northumbria. It has some of Scotland's earliest recorded place-names, one of which was included in a previous study of Old English colour terms in place-names (Hough 2006). The current project is uncovering far more. The coastal parishes of Cockburnspath and Coldingham contain many names for coastal features and watercourses, widely considered to be among the types of features named first by incoming settlers. Other relevant names occur inland. A striking aspect of the colour terms represented in these names is the high incidence of the Basic Colour Terms *black* and *white*, followed by *red*. It is intriguing that these correspond to the first three basic colour categories within the evolutionary sequence proposed by Berlin and Kay (1969) and discussed most recently by Biggam (2012:70–85) despite the fact that English had developed well beyond a Stage II language by the time of the Anglo-Northumbrian settlements.

Previous scholarship has explained pairs of names such as Blackadder and Whiteadder, rivers that join in the Berwickshire parish of Edrom, as 'opposing distinguishing marks' devoid of

colour meaning (Nicolaisen 2001:237). The new data, which do not fall into such neat pairs, may cast doubt on this hypothesis.

Berlin, Brent and Paul Kay. 1969. *Basic Color Terms: Their Universality and Evolution*. Berkeley and Los Angeles.

Biggam, C. P. 2012. *The Semantics of Colour: A Historical Approach*. Cambridge.

Hough, Carole. 2006. Colours of the landscape: Old English colour terms in place-names. *Progress in Colour Studies. Volume I. Language and Culture*, eds C. P. Biggam and C. J. Kay, 181–198. Amsterdam.

Nicolaisen, W. F. H. 2001. *Scottish Place-Names: Their Study and Significance*. 2nd edn. Edinburgh.

Condition-dependant Strategies of Eggshell Pigmentation: An experimental study in Japanese quail

[oral presentation]

Camille **Duval**, University of Birmingham, UK, Phillip **Cassey**, University of Birmingham, UK, Ivan **Miksik**, Academy of Sciences of the Czech Republic, S. James **Reynolds**, University of Birmingham, UK, and Karen A. **Spencer**, University of Glasgow, UK

Numerous hypotheses have been proposed to explain the diversity of avian eggshell colouration (reviewed in Riehl 2011). Recent evidence has shown a relationship between blue-green eggshell colour, due to biliverdin, an antioxidant, and female condition and there has been a debate around its potential adaptive significance as a signal to male partners (Moreno and Osorno 2003). The brown colouration of maculated eggshells, caused by the pro-oxidant protoporphyrin, could also reflect female condition in species without paternal care. Both pigments having opposite effects on an individual's oxidative stress, we hypothesised that they would be differentially allocated to eggshells according to female body condition. Food-restricted females would deposit more protoporphyrin and less biliverdin in their eggshells, leading to eggshell reflectance variations.

Three eggs were collected from each of 26 female Japanese quail that were either food-restricted or receiving *ad libitum* food (controls). Eggs were weighed and measured, and yolk proportion was calculated. Reflectance data on eggshell spot and background areas were recorded using spectrophotometry; eggshell pigments were identified and quantified using high performance liquid chromatography. We examined both protoporphyrin (brown spots) and biliverdin (blue-green background) and found that food-restricted birds were in poorer body condition and laid eggshells with less colourful spots but with brighter backgrounds. However, the total quantity of pigment allocated into the eggshell was not influenced by food restriction.

We propose that in species laying brown-spotted eggshells, their coloration could reflect a female's ability to employ mimicry as an anti-predation strategy and only those in good condition are able to deposit pigments on their eggshell that best match substrate colouration. We suggest that further experimental work on egg camouflage under different environmental conditions would allow us to elaborate the process of pigment deposition and the physiological

costs to females laying spotted eggshells.

Infant Colour Categories
[oral presentation]

Anna **Franklin**, University of Sussex, UK

In this talk I will review the case for the existence of infant colour categories. First, I will outline the converging evidence from multiple research groups that infants respond categorically to the continuum of colour. I will present evidence for categorical effects across multiple colour category boundaries, on various tasks, and in behavioural and electrophysiological measures. Second, I will consider whether there are methodological issues which could account for infants' 'categorical response'. I will show how infants' a-priori colour preferences have been controlled for, and discuss the role of colour metrics in these effects. Third, I will propose that infant colour categories are theoretically compatible with other findings, such as the language dependent nature of colour category effects in adults, and the potential lack of a categorical response to colour in baboons. I will also discuss how infant colour categories could relate to variation (and commonality) in the world's colour lexisons. I will emphasise the need for a new theoretical framework that can adequately incorporate all of the available evidence. Finally, I will consider how infants categorise colour in the absence of language, drawing on parallel research on infants' categorical response to other continua such as phonemes, facial expressions and orientation.

Demystifying Logvinenko's Object Colour Atlas
[oral presentation]

Brian **Funt**, Simon Fraser University, Canada

In a 2009 *Journal of Vision* paper [1], Alexander Logvinenko proposed a new object colour atlas. In contrast to the Munsell and NCS colour atlases, or CIE tristimulus values, the Logvinenko colour atlas is invariant to the illumination. This makes it a very important contribution to the literature on colour science. It has applications in all situations where the colours of objects need to be described including colour naming, colour object recognition, colour in architecture, colour printing, and so forth. However, Logvinenko's paper is quite technical and not easily understood. The present paper aims to demystify Logvinenko's atlas soasto provide an intuitive understanding of the main concepts involved. After some review of prerequisite topics such as colour solids, Schrödinger's [2] optimal colour stimuli, and metamerism, it will describe the Logvinenko's main concepts. These include his use of a "rectangular metamer" as the underlying component of the atlas; the idea of such a rectangular metamer as a representative of an

equivalence class of metamers; the concept of illumination invariance as it relates to an atlas; and the notion of illumination induced colour stimulus shift (i.e., why some colours may change their colour coordinates despite the atlas being illumination invariant). Using the Matlab implementation provided by Godau et al. [3], the theory will be further illustrated with some practical examples.

[1]A. D. Logvinenko, An Object Color Space. *J.Vis.*, 9(11): 1–23, 10 2009.
[2]E. Schrödinger, Theorie der Pigmente von Grösster Leuchtkraft. *Annalen der Physik*, 62: 603–622, 1920.
[3]C. Godau and B. Funt, The Logvinenko Object Color Atlas in Practice. *Color Research and Application*, DOI: 10.1002/col.20680, August 2011.

Radial Category Profiling in the Investigation of Polysemy of Colour Terms
[oral presentation]

Ewa **Gieroń-Czepczor**, State Higher Vocational School in Racibórz, Poland

This paper reports on a method of analysis of polysemy, known as *radial category profiling*, applied in research into the six most frequent colour terms in two languages, English and Polish. These include: *white* and *biały, black* and *czarny, red* and *czerwony, yellow* and *żółty, blue* and *niebieski,* and *green* and *zielony*, and correlate with the primary BCTs. The research, conducted within the framework of cognitive semantics and with the help of two online corpora, the BNC and the PWN Korpus, seeks to provide a picture of each colour term as a cognitive category, presented as a network of related senses associated with the central (prototypical) meaning, and – additionally – to attest the levels of entrenchment of respective senses on the basis of quantitative data.

An extensive investigation into thousands of citations of naturally-occurring language at various stages of the project contributed to the achievement of the assumed goals by establishing (a) the prototypical referents determining the conceptual structures of the BCTs as cognitive categories, (b) the respective extended ('figurative') meanings on the basis of collocational patterns revealed in corpus concordances, (c) semantic realizations of underlying conceptual metaphors and metonymies, (d) the entrenchment of attested meanings based on frequency counts.

The results of the study, presented in the form of radial networks (Lakoff), which have been supplemented by frequency data reflected in the sizes of the nodes, provide substantial material for contrastive, intralingual and cross-linguisitic, analysis of colour terms as exponents of conceptual structures, whether shaped by universal human conceptualisations or culture-specific phenomena.

Berlin, B. & Kay, P. (1969). *Basic Color Terms. Their Universality and Evolution*. Berkeley, CA.: University of California Press.
Kövecses, Z. (2003). *Metaphor and Emotion. Language, Culture and Body in Human Feeling*. Cambridge: Cambridge University Press.

Kay, P. (1975). Synchronic variability and diachronic change in basic colour terms. *Language in Society 4*, pp. 257-270.

Lakoff, G. (1987). *Women, Fire, and Dangerous Things. What Categories Reveal about the Mind.* The University of Chicago Press. Chicago and London.

Rosch, E. (1975). Cognitive representation of semantic categories, *Journal of Experimental Psychology 104(3),* pp. 192-233.

Taylor, J. R. (2003). Category extension by metonymy and metaphor. In R. Dirven & R. Pörings (eds.), *Metaphor and Metonymy in Comparison and Contrast* (pp. 323-347). Berlin: Mouton de Gruyter.

Colorfulness and Reflectivity in Daylit Spaces:
How color reflectivity affects experience and performance
[oral presentation]

Esther **Hagenlocher**, University of Oregon, USA

Buildings consume 70% of U.S. electrical energy, most of it for electrical light. Daylighting is therefore an important strategy to save energy and reduce greenhouse gases.

My research focuses on color reflectivity to understand how to use reflectivity with daylighting in interior spaces to improve lighting efficiency and visual comfort.

Daylit spaces with high reflectivity distribute light better, are brighter, and therefore more efficient. As you move away from the window, the daylight in a room is provided decreasingly by the sky and increasingly by the reflectivity of the interior surfaces.
Spaces with high reflectivity have a lower contrast between the brightness of the light at the window and that of the interior surfaces, which increases visual performance and comfort.
Experiments indicate that designers/people can't judge the light reflectivity of colors by just looking at them.

Despite the benefits of reflectivity, rooms are not typically designed with more reflective surfaces because our aesthetic valuing of dark rich colors conflicts with the high reflectivity that is more effective for daylighting. Reflectivity apertures can improve the performance of a building's system and increase the occupants' sense of well-being.

This paper describes color experiments and a timeline I am working on that traces scientific and artistic thinking about color and how they have interacted historically. This is part of a larger research project on Reflectivity in Daylit Spaces, which focuses on the performance and perception of color in interior spaces.

Exploring the Metaphorical Use of Colour with the *Historical Thesaurus of English*
[oral presentation]

Rachael **Hamilton**, University of Glasgow, UK

The role of metaphor in language has received considerable attention within linguistics in

recent years and one semantic category which lends itself to metaphor is colour. Despite this, few works have analysed the metaphorical use of colour terms, and those which have share similar methodologies by analysing phrases from various dictionaries.

This paper will introduce potential new approaches to the study of metaphor and colour. The recently published *Historical Thesaurus of the Oxford English Dictionary* (*HTOED*) (2009) contains a record of the English language from Old English to the present day and groups words by meaning into categories. The AHRC-funded *Mapping Metaphor* project, in progress at the University of Glasgow, utilises the data in the *Historical Thesaurus* database to explore the evolution of metaphor through the history of English. This project presents the first opportunity to undertake an empirical investigation of the overlap between colour and other domains by utilising the unique system of categorisation of the *HTOED.* Furthermore, the use of electronic corpora can be used to make a close examination of the linguistic contexts in which the colour metaphors appear.

The question of whether metaphorical productivity of colour terms correlate with Berlin and Kay's (1969) (B&K) evolutionary hierarchy has been debated by scholars such as Kikuchi and Lichtenberk (1983) and Hill (2008). Further investigation may make it possible to test the hypothesis that metaphorical productivity can be added to the tests for basicness proposed by B&K and revised by other scholars.

Berlin, B. and P. Kay, 1969. *Basic Color Terms: Their Universality and Evolution,* Stanford, California: Center for the study of Language and Information.

Hill, P. M. 2008. The metaphorical use of colour terms in Slavonic languages, in *Themes and Variations in Slavic Languages and Cultures,* edited by D. N. Wells, Perth: Australia and New Zealand Slavists' Association, 62–83.

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Study of Interactive Installations as a Result of the Mediation between Body and Colour Materialized by Light Source

[poster presentation]

Juliana **Henno** and Monica **Tavares**, University of Sao Paolo, Brazil

In the interactive installations of New Technologies of Communication (NTC) there are certain artworks that are developed through the mediation of the body and colour materialized by light source. Bearing in mind this particular artwork profile, this article aims to examine the two pieces of artwork under consideration: Forest of Light (2009, Totem Collective) and Ultra Gamma (2011, Ezri Tarazi & d-Vision Group) in which physical contact between the receiver and the artwork through the colour as a light source is required and indispensable in the recovery of the poetical proposal suggested by the artists. In the first part of this article, we will discuss what underlies the dialectics between material versus abstract, casual versus controlled,

individual versus collective and aesthetic versus semantic information. In the second part we will conduct a detailed study of the images presented above, highlighting how these dialectics can contribute in the understanding of how the artist has poetically used colour as a source of light in order to seduce the receiver into an exchange relationship with the artwork.

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Colour terms in Estonian Sign Language

[oral presentation]

Liivi **Hollman**, Institute of the Estonian Language, Tallinn, Estonia

Basic colour terms in sign languages have not been as extensively studied as colour terms in spoken languages. The existing studies however show that the universalistic theory of lexicalization of basic colour terms follows the same pattern found in spoken languages.

Colour terms in Estonian Sign Language, a small language used by approximately 1,500 Estonian Deaf people, have been studied following Davies and Corbett's (1995) field method, consisting of three tasks: list task, colour naming task and colour vision test. The results show that Estonian Sign Language is a stage Vll language and has nine basic colour terms: BLACK, WHITE, RED, YELLOW, GREEN, BLUE, GRAY, BROWN and PINK/PURPLE. According to the data collected the basic colour terms hierarchy is clearly displayed starting with more salient native ESL signs (BLACK, WHITE, RED) and having more recent loans from spoken language lower in the hierarchy (ORANGE, PURPLE, BEIGE).

In another study the methodology and research materials of the Sign Language Typology project of International Institute for Sign Language and Deaf Studies (University of Central Lancashire) was used for the data collection. Besides numerous compounds and longer descriptions this study also reveals a wide variety of manual (speed, intensity, direction of the movement, reduplication) and non-manual (squint or raised eyebrows, head and body movements) markers used to compare different levels of darkness, lightness and saturation. These features more clearly become evident through the dialogues used in the latter study.

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Colour Ordering and its Impact within the Philosophy of Roger Bacon

[oral presentation]

Michael J. **Huxtable**, Durham University, UK

This paper will develop a line of study initiated by an interdisciplinary research group at Durham University called 'The Ordered Universe'. A forthcoming outcome of the 2010-11 programme will be a critical edition of Robert Grosseteste's treatise, *De colore,* published by PIMS. My contribution to this volume is a general introduction to colour theory in medieval thought and culture and a section on the reception of the *De colore* by scholastic and wider readerships. One aspect of this latter section includes a brief consideration of Roger Bacon's use of the text in his major work, the *De multiplicatione specierum*. For a paper for PICS12, I should like to develop this line of enquiry and look in detail at some specific passages from the *De multiplicatione specierum* and discuss them as showing a discrete theory of colour and/or deference to a much revered authority (Grosseteste).

I would like to acknowledge the other members of the research group within which my idea for this paper emerged: Prof. Tom McLeish (Physics), Dr Giles Gasper (History), Dr Neil Cartlidge (English), Dr Hannah Smithson (Psychology). Visiting members have included Prof. Faith Wallis, Prof. Mary Carruthers, Dr Greti Dinkova-Braun and Dr Cecilia Panti.

The Curious Case of Tetrachromacy

[oral presentation]

Gabriele **Jordan**, Newcastle University, UK

Colour vision is often taken for granted and many people assume that our perceptual worlds are the same. However, this is not the case since marked inter-individual differences exist both within the colour-normal population as well as within the sub-group of individuals diagnosed as colour deficient. The perceptual differences are caused primarily by the variability of two X-linked genes coding for the middle- (M) and long-wave sensitive (L) cone photopigments in the retina.

The talk will focus on those 12% of women who are carriers of mild colour anomalies and whose retinae contain four rather than three classes of cone. The question arises whether the extra retinal cone signal is sufficient to provide the carriers with an additional dimension of colour vision.

We have recently addressed the question using two psychophysical tests (colour discrimination of lights in the Rayleigh region and multidimensional scaling of pigment samples) and molecular genetic analyses on a selected population of obligate carriers and controls. We did find one strong case of tetrachromacy, but overall our results suggest that tetrachromacy is not afforded automatically to those individuals with four types of cone. It critically depends on factors such as the spectral separation between cone types and the ratio of cones in the retina. It is not clear, however, whether these factors suffice to confer behavioural tetrachromacy.

Features of Color Categories

[oral presentation]

Yasmina **Jraissati**, American University of Beirut, Lebanon, and Elley **Wakui**, University of East London, UK

In the debate regarding color categorization, opposing so-called universalism to linguistic relativism, agreement regarding the influence of lexical categories on perception has today been reached. However, when it comes to how categories are formed in the first place, divergences are maintained. Relativists argue that language use is what accounts for the stabilization of color categories; universalists contend that it is 'perceptual saliency'. We argue that both these approaches are not satisfactory: Not all color expressions stabilize into psychologically salient categories; not all psychologically salient categories are perceptually salient. An alternative account of the emergence of color categories is required.

According to our approach, color categories are psychologically salient by definition -- this is what characterizes the possession of a category by a speaker. Psychological saliency (PSY) comes in degrees, so does 'perceptual saliency' (PER), a slippery notion, often used in the literature, that we take to be involved in any judgment that has some perceptual basis. Arguably, PER is *at least partly* determined by our perceptual makeup, and PSY by language use. The connection between PER and PSY is not an all or none issue, as has been previously suggested. We propose that categories are both perceptually and psychologically salient, at different degrees and in different proportions.

We proceeded with a series of experiments involving accuracy measures, reaction times and training. Our results show that there may indeed be two distinct, yet related, features in categories.

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REGIER, T., KAY, P., & KHETARPAL, N. (2007) Color naming reflects optimal partitions of color space. Proceedings of the National Academy of Sciences, 104, pp. 1436-1441.

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Forgotten Colours: Munsell crayons and the short-lived glory of Middle Blue Green

[oral presentation]

H. **Lazar-Meyn**, Toronto, Canada

Colour studies frequently rely on Munsell colour chips as standardized colour stimuli.[1] However, Munsell crayons also were available as a training device for identifying colours. Binney & Smith Co. (now Crayola LLC), a crayon manufacturer based in the United States,

bought the line in 1926 and manufactured Munsell-Crayola and Munsell-Perma crayons.[2] The largest Munsell and Munsell-Perma sets consist of five principal and five intermediate hues, each at maximum chroma and at middle value and middle chroma, plus middle grey and black.[3]

Only one of the Munsell-specific colour names, middle blue green, survived in the popular Crayola® line following the discontinuation of the full Munsell colour set during World War II. In 1958, middle blue green and a number of other colour names were supplanted in Crayola's first 64-colour set of crayons. Many of these pre-1958 colour names have been lost to Crayola's official history.[4]

This paper uses the application Color Identifier[5] to quantify and name the 22 colours of the Munsell and Munsell-Perma crayon sets and Crayola's pre- and post-1958 crayon colours. Usage of descriptive colour names promulgated by Crayola (e.g., cerulean blue, thistle, Indian red) by the application and in spoken and written English in the United States and Canada also will be evaluated.

[1] See , e.g., Berlin and Kay [1969], *Basic Colour Terms*. Berkeley: University of California Press, p. 5.
[2] http://www.crayoncollecting.com/ccolor06.htm
[3] Author's collection.
[4] See http://www.crayola.com/about/our-history/index.cfm;
http://www.crayola.com/colorcensus/history/chronology.cfm;
http://www.crayoncollecting.com/ccolor0.htm
[5] http://www.greengar.com/apps/color-identifier/

Could I Understand Colour Cognition using Colour Blindness Simulations? Right and wrong uses of simulation tools

[oral presentation]

Julio **Lillo**, Humberto **Moreira**, L. **Alvaro**
and D. **Majarín**, Universidad Complutense de Madrid, Spain

Normal colour vision is trichromatic: the retina contains three different kinds of cone receptors that differ in their relative sensitivity to wavelength. However some people – dichromats- have only two different cone types and consequently their colour vision is different to trichromats. This paper is about the tools used for simulating dichromatic colour perception: their types, uses and functional philosophy will be described; and a new technique, (´*Simulcheck*´) for evaluating the accuracy of these tools will be described.
The aim of simulation tools is to try to transform stimuli so that trichromats see the transformed stimuli as dichromats would see the untransformed stimuli. Such tools are useful in finding colour combinations that function effectively for all observers (´universal design´) and for understanding why it is difficult for the dichromats to use some basic colour terms correctly.
We assume that with a valid simulation, the behaviour of trichromats and dichromats would be equivalent. Simulcheck uses two tasks for comparing real and simulated dichromats: (1) Selection of pseudogreys (greens and red-purples that dichromats do not differentiate from greys) and (2) lightness of pseudogreys (dichromats lightness perception differs from trichromats). Simulcheck application showed that there are important differences for the type

and magnitude of the errors produced by the three evaluated simulation tools (Variantor, Coblis and Vienot). The chapter end with some indications for future simulation tools related with protanopes and deuteranopes' red-green mechanism residual activity.

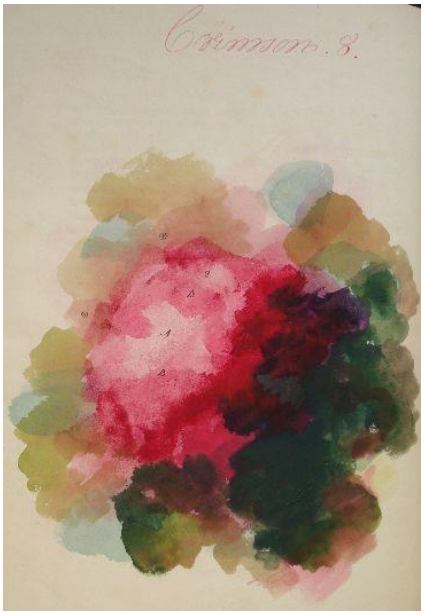
Sometimes, Color Perception is not Categorical
[oral presentation]

Delwin **Lindsey** and Angela **Brown**, Ohio State University, USA

In this article, we report that in visual search, desaturated reddish targets are much easier to find than other desaturated targets, even when perceptual differences between targets and distractors are carefully equated. Observers searched for desaturated targets among mixtures of white and saturated distractors. Reaction times were hundreds of milliseconds faster for the most effective (reddish) targets than for the least effective (purplish) targets. The advantage for desaturated reds did not reflect an advantage for the lexical category "pink," because reaction times did not follow named color categories. Many pink stimuli were not found quickly, and many quickly found stimuli were not labeled "pink." Other possible explanations (e.g., linear-separability effects) also failed. Instead, we propose that guidance of visual search for desaturated colors is based on a combination of low-level color-opponent signals that is different from the combinations that produce perceived color. We speculate that this guidance might reflect a specialization for human skin.

Enlightened Romanticism: Mary Gartside's colour theory in the age of Moses Harris, Goethe and George Field
[oral presentation]

Alexandra **Loske**, University of Sussex, UK



Mary Gartside: Crimson, watercolour from An Essay on a New Theory of Colours, London, 1808.

The aim of this paper is to evaluate the work of Mary Gartside, a British female colour theorist,

active in London between 1781 and 1808. She published three books between 1805 and 1808. In chronological and intellectual terms Gartside can cautiously be regarded an exemplary link between Moses Harris, who published a short but important theory of colour in the second half of the eighteenth century, and J.W. von Goethe's highly influential Zur Farbenlehre, published in Germany in 1810. Gartside's colour theory was published privately under the disguise of a traditional water colouring manual, illustrated with stunning abstract colour blots (see example above). Until well into the twentieth century, she remained the only woman known to have published a theory of colour. In contrast to Goethe and other colour theorists in the late 18th and early 19th century Gartside was less inclined to follow the anti-Newtonian attitudes of the Romantic movement.

Proposed structure of the paper:
I will begin by outlining the state of colour theory in Gartside's time and introduce her own publications on the subject. I will then draw conclusions about her intellectual and personal circumstances by examining references in her own publications to scientists, artists and writers who influenced her, as well as a series of unpublished documents. The concluding part will take a closer look at her colour theory, in relation to earlier theorists she credits in her writing. I will also suggest that certain elements of her theory might have pre-dated some of Goethe's ideas.
My research into Gartside was supported by the Colour Reference Library (Royal College of Art), who kindly provided me with images of Gartside's work, which will be included in my presentation.

Gender Differences in Colour Naming
[oral presentation]

Lindsay **Macdonald**, University College London, UK, Galina V. **Paramei**, Liverpool Hope University, Liverpool, UK, and Dimitris **Mylonas**, University College London, UK

A colour naming experiment is being conducted via the Web[1], enabling a large number of observers from culturally and demographically diverse populations world-wide to contribute. The subject has to provide a name for each of 20 single colour patches, presented in sequence at the centre of the display screen on a grey background. The colour naming is unconstrained, so that any combination of words could be used. Out of a total of nearly 3,000 respondents to date, approximately 45% have used the English language,[2] resulting in 5428 observations of 1226 unique colour words. 51% of the responses consisted of a single-word, 42% of two words and 6% of three or more words. The eleven basic colour terms proposed by Berlin & Kay (1969) occurred in 28% while non-basic terms were involved in 23% of responses.
These results were analysed for gender differences. The number of words (from 1 to 6) employed for a colour was similar for female (58%) and male (41%), with approximately 29% of all responses being one of the 11 basic colour terms. Females were a little more likely to use some other single-word term, but a little less likely to use a two-word term. In the use of the eleven basic colour terms there was little difference, with a slight tendency for females to use 'blue' and 'pink' more frequently, and for males to use 'purple' more frequently. Of the total of 1226 different colour descriptors in the responses, however, 993 (81%) were used by females and 634 (51.7%) by males, indicating that female subjects had a considerably larger descriptive colour vocabulary. When considering response times, there was also a significant difference,

with females being on average 17% faster for all basic colour terms.

[1]www.colournaming.com
[2]The site also provides versions in Greek, Spanish, German, Catalan, Italian and Chinese.

The Language of Colour
[oral presentation]

Asifa **Majid**, Max Planck Institute for Psycholinguistics, Netherlands

The state-of-the-art for examining semantic categories is to take a diverse language sample and then to extrapolate the common elements across these differing languages. If across a number of languages the same patterns are found, then a cognitive universal is posited; for example, that properties of the human visual system constrain the language of colour. This was the rationale behind the Berlin and Kay 1969 study, developed further in the World Colour Survey. In this talk, I re-examine the posited universality in the language for colour by presenting emerging results from two major projects.

First, I present the results of a new study on the "language of perception", which examines the relative *codability* of different sensory modalities, including colour (as well as smell, taste, and so forth). In the language of perception project, we compare 23 languages from around the world, including three unrelated sign languages, for the codability of perceptual experiences (Majid & Levinson, 2011). We find that there is considerable variation in the codability of sensory modalities across cultures. While languages like English and American Sign Language show relatively high codability for colour, other languages, such as Umpila (Paman, Australia) and Kata Kolok (village sign language, Bali), show poor codability in this domain. Particularly striking is the finding that there are contemporary language systems with substantial gaps in their colour naming systems (non-partitioning languages): large parts of the colour space are left unnamed. Using fine-grained analyses, we can see that speakers can use a number of ad-hoc strategies to express colour when abstract colour terminology is absent in language. This study, using a maximally diverse language sample, shows that there is substantial variation cross-linguistically in expressibility of colour experiences.

The "language of perception" study, like prior work on colour, attempts to avoid language family relatedness but this is at the expense of the large amount of data available to researchers. Of the 6,000 or so language spoken today, most are not independent innovations but rather descendents from a common ancestor. The second project I will talk about – "evolution of semantics systems" – takes advantage of techniques from evolutionary biology to model colour naming systems within a single language family (Majid, Jordan, & Dunn, 2011). As might be predicted, we can show that colour naming systems in Germanic languages are very similar to one another. More surprisingly, perhaps, is the finding that the differences between languages, where apparent, are not predicted by language relatedness (when geographical distance is controlled for). Intriguingly, we find a small negative correlation between colour naming systems and phylogenetic distance: very closely related "sister languages" are less similar in their colour categories than expected. This suggests that for closely related languages in geographical proximity there is impetus for greater diversification, most likely due to an

intentional process of dissimilation. Together the results from these two studies show that there is still much to discover about colour naming in the world's languages.

Cognitive and Linguistic Aspects of Colour Categorization and Naming
[oral presentation]

Marzenna **Mioduszewska**, Universidad Rey Juan Carlos, Madrid, Spain

It is known that a large number of knowledge sources such as vision, hearing, touch and smell contribute to the establishment of mental representations of space (Levinson 2003, Jackendoff 1992, 1997, Herskovits 1986, 1997, Vieu 1997). It is also to be noted that human minds have the ability to establish systematic relationships between linguistic forms and perceptually based knowledge. This grounding of linguistic symbols in perceptual representations (Harnad 1990, Regier 1996, Regier and Carlson 2001) is essential if we want to understand linguistic abilities and linguistic structure.

This paper is a part of the on-going project (Mioduszewska 2010) dedicated to the analysis of perceptions and their representation in language. It is based on data drawn from a series of behavioural experiments carried out during a wine-tasting procedure conducted in Spanish. I will focus on colour description as the most thoroughly categorized domain, showing the most frequently used strategies to name and describe colours in wine tasting notes. In some cases, I will compare these descriptions with less classified sensory modalities such as touch, taste and smell, especially in those examples where colour stands for some of the characteristics in odour and taste.

As already noted, this paper represents work in progress and it aims at indicating a possible way of analysing the field of spatial reasoning. Dealing with language as an open system, connected to a variety of spatial representations, one should bear in mind the restrictions that spatial cognition puts on the relations that language can express. That is why, quite frequently, linguistic terms or expressions are only rough approximations to a description of a particular colour or shade. In many cases, language cannot express the perceptible distinctions of colour. That is why it needs to be complemented by other systems or synesthetic mapping among different senses.

Some of the problems to be addressed are:

1. How are dynamic aspects of spatial/perceptual information conveyed?
2. What is the relation between different perceptions and their linguistic representation?
3. Can we translate from one type of representation to the other as we code differently when dealing with different sensory impressions?

Albertazzi, L. (ed.) (2002) *Unfolding Perceptual Continua*. Amsterdam: John Benjamins
Herskovits, A. (1997) Language, Spatial Cognition and Vision. In *Spatial and Temporal*

Reasoning. O. Stock (ed.) 155-202. Dordrecht: Kluwer
Levinson, S.C. (2003) *Space in Language and Cognition.* Cambridge: Cambridge University Press
Mioduszewska, M. (2010) On Perceptual Space. Paper presented at Interdisciplinary Conference on Space and Time across Languages, Disciplines and Cultures. University of Cambridge, UK
Regier, T. and L.A. Carlson (2001) Grounding Spatial Language in Perception: An Empirical and Computational Investigation. *Journal of Experimental Psychology: General*, 130(2), 273-98.

Exploring the Colours of Voices
[oral presentation]

Anja **Moos**, Rachel **Smith** and David **Simmons**, University of Glasgow, UK

Colour terms are occasionally used to describe a voice metaphorically, e.g. 'golden voice'. But some people with a neurological multi-sensory condition called synaesthesia have automatic and involuntary colour associations with the sound of a voice that are not metaphorical. Although synaesthetic perceptions triggered by the sounds of people's voices have been described anecdotally, this sub-type of synaesthesia has received little scientific attention. We therefore conducted an online survey of voice → colour synaesthesia. Voice synaesthetes, phoneticians (i.e. speech scientists) and controls were asked to describe recorded voices in their own words and assign a colour to it. Two sentences spoken by two trained phoneticians in 10 different voice qualities (VQs) each, e.g. nasal, whisper, falsetto, served as stimuli.
It was found that pitch and other acoustic factors of the voice influenced brightness and colour associations with the voice for all groups but showed some idiosyncratic patterns for synaesthetes and others for phoneticians. A re-test with a subset of the stimuli revealed that synaesthetes were more consistent than controls in choosing the same or similar colours again for the same VQs, but group differences did not reach significance. Analysis of the verbal descriptions showed a strong usage of personality descriptions across all groups. Additionally, phoneticians used more technical terms to describe the VQs, but synaesthetes used more terms for colour, texture and shape to describe the voices.

Motivational Analysis of Some Colour Names
[oral presentation]

Vilja **Oja**, Institute of the Estonian Language, Tallinn, Estonia

The paper will discuss words for mixed hues of yellow, red and brown. Although the study is focused on Estonian colour terms, it will also address its cognate languages and the Indo-European equivalents of the relevant loanwords. It often happens that semantic motivations of words referring to a concept, object or phenomenon are similar for different languages. It may even be hard to decide whether one is looking just at several loanwords or whether one of them is actually a genuine derivative. Therefore the study of naming motives addresses the broader issue of the origin of some colour terms, including loan relations.

In view of the naming motivation and the possible donor words the semantic relations of the colour terms are analysed both, from the lexical and conceptual angles. The *rusk-* stemmed word, for example, is used differently in different Finnic languages: in Estonian and Votic it means 'brownish-red', in Karelian and some Veps dialects it is the basic term for 'red', while in Finnish and Ingrian it serves as the basic term for 'brown', although in those languages a noun of the same stem is also used to refer to the reddish colour of dawn (Koski 1983: 266 ff., Oja 2007: 195; Uusküla 2008: 394). The areal distribution of the dialect words will be illustrated by maps revealing probable language contacts and the travelling routes of loanwords.

Koski, Mauno (1983). *Värien nimitykset suomessa ja lähisukukielissä.* SUST 391. Helsinki: Suomalaisen Kirjallisuuden Seura.

Oja, Vilja (2007). Colour naming in Estonian and cognate languages. – Robert E. MacLaury, Galina V. Paramei, Don Dedrick (Eds), *Anthropology of Color. Interdisciplinary multilevel modeling*. Amsterdam, Philadelphia: John Benjamins, 189–209.

Uusküla, Mari (2007). The basic colour terms of Finnish. – *SKY Journal of Linguistics*, 20: 367–397.

The Color and Drawing as an Expressive Element of Violence in Children Aged 10-12 Years

[poster presentation]

Georgina **Ortiz** Hernández, National Autonomous University of Mexico

Violence is a social phenomenon which although it has been present in all the human being history is not inherent to all individuals and it is known that the social environment is a factor which contributes to its development.

The fear that violence produce is heightened in children, that is why it is considered important to know their opinion about violence, how they perceive it and if it is possible how they feel it. One way to look for these answers is through two means that are familiar to them and not dangerous: **color and drawing**.

Both are privileged elements to investigate violence through a visual image, because drawing is a spontaneous, motor, coordinate and very complex activity which contributes to the formation of the personality, while color is an element which stimulates the emotions and as a communication element it informs about emotional states through the analysis of their meanings and the formation of chromatic patterns (Ortiz: 2011).

For these reasons, the present investigation was oriented towards the study of the way the children draw and color violent and no violent scenes since their drawings would let us know their personal experiences.

Our goals were:

To know how children of ten to twelve years perceive violence and no-violence through their graphical representations.

To know the colors and meanings that children of ten to twelve years use in their graphical representations of violence and no-violence.

Population and sample:

The sample was obtained from the Mexican population that inhabits in México City. The total

sample was 25 children, equivalent to 50 drawings.
Method
We use the qualitative method with a semiotic and rhetorical analysis of the image for their interpretation.

Ortiz, G. (2011) El significado de los colores. México. Editorial Trillas.

Blue Colour Terms in Italian Monolinguals and Bilinguals

[poster presentation]

Galina V. **Paramei** and Cristina **Stara**,
Liverpool Hope University, Liverpool, UK

Italian is argued to have three basic colour terms (CTs) for English *blue*: *celeste* 'light blue', *azzurro* 'medium blue' and *blu* 'dark blue' (Uusküla, 2012). We address this proposition by exploring Italian CTs designating the blue area of a colour space. Monolingual Italians (N=13; Sardinia, Alghero) and 13 English monolinguals (N=13; Liverpool, UK) performed a colour mapping task. In addition, we tested Italian-English bilinguals residing in the UK (N=13; Liverpool) in both languages, while questioning whether bilinguals' focal *blu* undergoes a shift towards the focal *blue*. Eight Munsell charts were employed spanning the Hue from cyan to blue-purple and varying in Value and Chroma. Participants named each chip using an unconstrained colour naming method. Following this, they indicated the best example of monolexemic CTs (e.g. *turquoise*, *blue*, English; *turchese*, *azzurro*, *indaco*, Italian). For Italian and English 'blue' CTs we constructed '3D Munsell maps'. For Italian speakers, monolingual and bilingual, we found that to name the blue area they require at least three CTs, with most frequent and consistent use of *celeste*, *azzurro* and *blu*. As expected, the Italian focal *blu* appeared darker than the English focal *blue*. For Italian-English bilinguals, the findings are twofold: (i) Location of bilinguals' focal *blu* deviated from that of Italian monolinguals. (ii) The bilinguals' focal *blu* was shifted towards the English focal *blue* (cf. Athanasopoulos, 2009). The extent of focal colour shift is discussed in relation to bilinguals' proficiency in English and duration of immersion in the UK.

Athanasopoulos P (2009). Cognitive representation of colour in bilinguals: the case of Greek blues. *Biling Lang Cogn 12*: 83-95.

Uusküla M (2012). Living under the Mediterranean sky and by the Mediterranean Sea: Terms for blue in Italian. In A. Borg (Ed.), *The Language of Color in the Mediterranean*, 2nd ed. (accepted).

Color Seeing and Speaking: Effects of biology, environment and language

[oral presentation]

Alessio **Plebe**, Vivian M. **De La Cruz**, and Paola **Pennisi**, University of Messina, Italy

The ability humans have of seeing colors is strongly influenced by three fundamental factors. A biological basis, that constrains and equips the visual system of our species, the environment, that provides the spectrum of light reflectance and our experience with the world, and human cultures, in which colors acquire names that powerfully bind and categorize them within the color spectrum. The relationship between biology and culture has been highly controversial in many scientific arenas, and in color studies has led to the color terms relativism/universalism debate. The work of Berlin and Kay (1969) provided evidence towards universalism, but recent studies on Berinmo and Himba languages have provided opposite evidence (Roberson, Davidoff, Davies, & Shapiro, 2004). Much less attention has been paid to the role of the environment. The cases of Berinmo and Himba can be helpful in investigating the possible impact the environment has on the organization of color perception. The landscapes in which these two groups live, are drastically different. One, is immersed in the luxurious vegetation of Papua New Guinea, and the other, in the rocky desert lands of Northern Namibia. Moreover, their landscapes have remained virtually unchanged in color since their respective languages emerged and developed. We propose a computational model of visual and linguistic processing paths in the cortex, derived from a general architecture for investigating vision-language integration (Plebe, Mazzone, & De La Cruz, 2011a) and previously used for simulating the influence of Berinmo and Himba color terms (Plebe, Mazzone, & De La Cruz, 2011b). We simulate the early effects of visual environments and the later effects of language in the development of color perception, exposing the model to real landscape images and spoken color terms.

Berlin, B., & Kay, P. (1969). *Basic color terms. their universality and evolution*. Berkeley (CA): California University Press.

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Plebe, A.,Mazzone,M., & De La Cruz, V.M. (2011b). Colors and color adjectives in the cortex. In C. Biggam, C. Hough, C. J. Kay, & D. Simmons (Eds.), *New directions in colour studies* (p. 415-428). Amsterdam: John Benjamins.

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Color, Music, and Emotion in Mexican and North American Populations
[poster presentation]

Lilia R. **Prado-León**, University of Guadalajara, Mexico, Karen **Schloss**, University of California, Berkeley, USA, and Stephen **Palmer**, University of California, Berkeley, USA

Schloss, Lawler, and Palmer (2008) studied the relation between colors and music by having participants pick the colors that “went best” and “went worst” with different musical selections. We repeated this experiment with 49 Mexican participants to investigate how culture might influence such color-music associations. Three types of data were collected: 1) color-music associations, 2) color-emotion associations, and 3) music-emotion associations. The experimental stimuli were 37 colors (see Palmer & Schloss, 2010) and 18 brief samples of classical orchestral music: six pieces each by Mozart, Brahms, and Bach that varied in mode (major or minor) and tempo (slow, medium or fast). Music that was faster and major was associated with brighter, more saturated, warmer colors and was judged to be happier and

stronger, whereas music that was slower and minor was associated with darker, less saturated, cooler colors and judged to be sadder, weaker, and calmer. We observed high correlations between the emotional associations of music and the emotional associations of the colors that were chosen to go well with the music, being highest for happy/sad (r = .97) and weakest for angry/calm (r =.68). These results are very similar to the pattern found in North America.

Schloss, K. B., Lawler, P., & Palmer, S. E. "The Color of Music." Paper presented at the *8th Annual Meeting of the Vision Science Society*, Naples, FL, May 2008.

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Investigating the Colourful Past:
Applications of scientific and historical research to textile dyes
[oral presentation]

Anita **Quye**, University of Glasgow, UK

The newly-founded Centre for Textile Conservation and Technical Art History at the University of Glasgow brings together expertise in textile conservation, technical art history, textile history and conservation science for research and teaching. With its focus on historical textile and art collections, the Centre understandably places investigations into the sources and significance of coloured materials particularly high on its research agenda. Between the Centre's research specialisms of its staff, its scientific analysis facilities, an interdisciplinary partnership focus, and collaborative links with significant museum and gallery collections nationally and internationally, there is great potential for extending existing research and developing exciting new collaborations, especially in the field of historical dyes.

The interdisciplinary nature of dyes research through the study of the actual artefacts by combining materials analysis, cultural reference and socioeconomic understanding of historical periods brings together chemists, historians, archivists and conservators in a dynamic collaborative environment. The success of such a partnership of expertise is well-illustrated by a project initiated by NMS to investigate the colour sources and influences of eighteenth and early nineteenth century quality Scottish tartans. The successful approach and outcomes from this research will be presented in this talk to demonstrate the collaborative strengths and benefits of research of a truly interdisciplinary nature. Two exciting and ambitious new doctoral projects by the Centre of a similar nature, both starting in October 2012, will then be introduced. One project is focussing on interpreting and recreating the dye chemists' methods for textile dyeing in late nineteenth century Glasgow involving archival research, synthetic chemistry and scientific analysis. The other project is an historical and chemical investigation of dyes in high status sixteenth century to eighteenth century Chinese costume and textiles of the Ming and Qing Dynasty, also bringing together archival research and scientific analysis, this time with art history and textile history.

As will be seen, the colour red is a dominant feature in all three projects, a topic that is particularly interesting and is evolving in other art and textile research by the Centre.

Sorting and naming blue: an Estonian case study
[oral presentation]

Kaidi **Rätsep**, Institute of the Estonian Language, Tallinn, Estonia

There is one basic term for blue in Estonian - *sinine*. A previous study by Sutrop (2002) suggested that there might be two more psycholinguistic categories: *hele-sinine* 'light blue' and *tume-sinine* 'dark blue'. This research was conducted to study the categorisation of blue.

The experiment consisted of three tasks: list, free-sorting and colour-naming tasks. Fifty-five Color-aid tiles from the blue-green-purple area (except for four tiles from the yellow region) were selected from the 314 tile full set. Both warm and cold tones were included.

In the free-sorting task, the subjects were instructed to sort all the tiles ("*Please sort the tiles as you wish*") and then name the groups. In the colour-naming task, the subjects were asked to name each tile separately. The answers were written down exactly as said by the subjects. The data from 39 subjects with normal colour vision was used.

In the free-sorting task, the most frequent group was named by using the term *sinine* 'blue' (frequency F = 236 for 44 tiles). *Hele-sinine* 'light blue' (F = 57 for 21 tiles) and *tume-sinine* 'dark blue' (F= 35 for 15 tiles) had relatively low frequencies.

In the colour-naming task, *hele-sinine* 'light blue', was the most frequent term (F = 211 for 27 tiles). *Sinine* 'blue' also had a high frequency (F = 180 for 24 tiles). *Tume-sinine* 'dark blue' had a lower frequency (F=80 for 13 tiles). The consensus in the tasks was lower than expected.

The results indicate that conducting the colour-naming task directly after the free-sorting task produced a priming effect. Based on this study, it is suggested that the free-sorting and naming tasks should not be conducted consequently, but rather separately to avoid a priming effect.

Categorical Perception of Color depends on Graded Category Structure
[oral presentation]

Debi **Roberson** and J. Richard **Hanley**, University of Essex, UK

Categorical labels appear to underpin Categorical Perception (CP) of color (e.g. Roberson, Pak & Hanley, 2008). Roberson and Hanley (2010) suggested that this occurs because category labels can create a conflict between levels of classification when two stimuli are compared. For example, two shades of blue that would be judged 'different' at a perceptual level would be judged 'same' at a category level. Hanley & Roberson (2011) performed a re-analysis of data from our previous investigations of CP for color (and for other perceptual continua) that had used a two-alternative forced choice test and showed that CP reflects graded category structure. This is because a marginal exemplar (e.g. a greenish-blue) may be inconsistently classified at study and test if it is seen at test in the

context of a better exemplar (a more central blue). This supports the view that CP does not reflect perceptual warping at category boundaries. In this presentation, we will present new data that investigates whether CP for color on a speeded visual search task also reflects graded category structure.

Basic Colour Terms in Scotland: A multilingual environment
[poster presentation]

David **Robinson**, University of Glasgow, UK

This research investigates what happens when different languages, each with its own Basic Colour Terms (BCTs), interact, over a period of more than a thousand years.
In any one language in Scotland (English, Scots, Norn, Gaelic or Welsh/British) the Basic Colour Terms might well have developed in accordance with the Berlin & Kay model if there had never been interaction between the peoples speaking these languages.

Despite no BCTs in English or Scots appearing to come from the Celtic languages, evidence has been found to suggest that one Gaelic term in particular, 'dearg', which was later adopted as a BCT for 'red', but which also has a range of 'figurative' meanings, usually negative, appears to have had these so-called 'figurative' meanings first. The reason for this semantic extension, and its consequences, are being investigated.

It is suggested that one significant consequence is that these negative meanings have been transferred to the Scots 'reid' and Scottish-English 'red', even having an effect on standard English, as exemplified by the proverbial 'red herring'.

In more recent times Celtic terms have taken on the meaning of English words, and English terms have been adopted at Stage VII, as with 'pinc' and 'orainds'.

This is part of a PhD research project examining lexical transfer from Gaelic to Scots and English.

Colour Prototypes and Symbolism, Yesterday and Nowadays
[poster presentation]

Lucia **Ronchi**, Giorgio Ronchi Foundation, Florence, Italy

According to the advanced visual research, the internal representation of the observed objects is not so stable and its fidelity is not so high as traditionally believed. One of the consequences is that also the existence of prototypical imagery, as traditionally defined, is infirmed. To understand the true meaning of this statement, we analyzed some situations where it applies:

a) - The estimate of the prototype is unstable in a laboratory experiment where the observer's task consists in finding the NCS sample matching the long term memorized prototypical color of

various (familiar) raw foods. The result is highly dependent on the details of the presentation mode.
b) - The analysis of the early literature, from the Bible to the 14th century, including Dante Alighieri and St. Francis, is imbued with prototypes and related symbols. A relatively few color names are used, while several known colored objects are frequently quoted (e.g. concerning the natural environment and its continuous variability). This is in line with the fact that color vision is inseparable from spatial vision, and, to recall a (non basic) color name for communication is known to be much more difficult than recalling the related name of a familiar object.

In conclusion, we find that various object colors are connected to color prototypes (in turn connected to a specific symbolism) still alive in our current language, and even to the superstitions. Note that since the antiquity the (global) concept of prototypical color coexists with and apparently contradictory color discrimination. Therefore, in agreement with the advanced visual research, the individual can choose the global invariable response or the detailed unstable response, depending on the task and behavior dependencies. Let us recall the intermediate possibility, the perceptual color and brightness constancy not valid for single, isolated, test object, since it requires (for a reference) the presence of three or four test objects simultaneously present in the visual field. Color prototypicality is stronger than perceptual constancy, because it may rely on a multisensory synesthesia, applied during his lifelong experience (or long term memory).

This is our defense of color protypicality, against the variability of the internal representstiion, emerging from laboratory experiments where the real environment is artificially deprived of real cues by poor simulations of the reality.

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The Categorization of Blue Spectrum in European Languages: Binding together linguistic and social aspects of colour studies

[oral presentation]

Irene **Ronga**, University College London, UK, and University of Turin, Italy, and Carla **Bazzanella**, University of Turin, Italy

Since Berlin and Kay's *Basic Color Terms* was published, colour categorization has become a crucial issue in the anthropological and linguistic debate between universalism and relativism. Recent studies, while providing overall support for Berlin and Kay's hierarchy (cf. e.g. Corbett and Davis 1997, MacLaury 2001, Kay and Maffi 2005), also highlighted the presence of possible exceptions, especially in the realm of blue (cf. e.g. Winawer et al. 2007 for Russian and Ronga

2009 for Italian).

The present research focuses on investigating blue-related lexicon in European languages. The study explores Italian exception, where blue domain is represented by two distinct colour terms (*blu* -'blue'- and *azzurro* -'light blue'), showing possible philological and historical reasons. A corpus-based analysis will be also employed to compare Italian categorization of blue with other European languages. A quantitative study of colour term frequency of occurrence and linguistic use, together with historical and anthropological factors, highlights the importance of idioms and linguistic collocations on colour prototypicality, thus suggesting possible explanations to the linguistic categorization of the blue spectrum.

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Her Blue Eyes are Red. A conceptual model of color metonym

[poster presentation]

Jodi L. **Sandford**, Università degli Studi di Perugia, Italy

How do humans conceptualize color experience through the crossmodal processing of visual perception and linguistic expression in distinguishing the whole and its parts? The lexical frame of color as a primary experience is often used to exemplify linguistic theories and yet there is still lack of a complete conceptual color model. Cognitive linguistics establishes a central role to meaning through the ideas of embodied experience, image schemas, and conceptual models developed through usage-based analysis. Conceptual metonym-metaphor mapping is a type of representation used to comprehend how linguistic elaboration of complex categories arises through embodied metonymical and metaphorical extension, resulting in a motivated illustration of lexical polysemy. In this paper the author presents the fifth level of a complete conceptual mapping (the other four levels have been presented in Sandford 2010, 2011a,b). The new part of this original mapping is Conceptual Color Metonym: relations between part-whole, part-part, whole-whole. Conceptual metonymic mapping, and the ties it establishes with primary metaphor, gives support to argumentation on how colors terms activate neural circuits that constitute conceptual metaphor mechanisms, in keeping with the neural theory of metaphor.

Sandford, Jodi L. 2011a. “Color Linguistic Vantage and The Surround”, Proc. VII National Color Conference. Gruppo del Colore – SIOF - Sapienza Univ. Roma, Italy. Colour and Colorimetry. Multidisciplinary Contributions. Vol. VII B (Ed.) M. Rossi. Maggioli Editore: (RN). pp. 153-160.

Sandford, Jodi L. 2011b. “Conceptual metaphor and the interaction between color and light”. AIC 2011, Zurich, Switzerland, Conference Proc., (eds.) V.M. Schindler - S. Cuber. Zurich: pro/colore. pp. 706-709.

Sandford, Jodi L. 2010. “I can tell you what color it is”, Cognition and the Brain in Language and Linguistics, Textus Vol. XXIII No. 3, (eds.) M. Bertuccelli Papi - F. J. Ruiz de Mendoza Ibáñez, Genova: Tilgher. pp. 719-735.

Colour and Motion in Charles Henry’s *Cercle Chromatique*

[oral presentation]

V. M. **Schindler**, Atelier Cler Etudes Chromatiques, Paris, France

The French scientist Charles Henry (1859-1926) conceived his colour circle on the basis of a theory of motion and direction. Thereby he considered movement (performed consciously or unconsciously) and human reaction (real or virtual) in terms of continuity and discontinuity or *dynamogeny* and *inhibition*. Establishing a specific correlation between these terms and colours, he developed a complex colour theory [1] based on contrast, rhythm and measurement. As well, he conceived his colour circle [2] as a tool for finding colour consonance or dissonance, in particular, for finding colour harmonies to be used in the applied arts. In contrast to its predecessors, Henry’s colour circle is an attempt to integrate additive and subtractive colour theories in a single system, although his system is still only a two-dimensional colour circle and not a spherical as in other developments. Initially this paper explores some relevant sources that influenced Henry’s view of visual perception and more specifically his notion of colour, such as the work of Auguste Rosenstiehl [3], Michel-Eugène Chevreul [4], and Hermann von Helmholtz [5]. It then discusses how Henry synthesized these different ideas in a colour theory whose sphere of influence includes artists such as Georges Seurat and Paul Signac as well as poets such as Jules Laforgue and Gustave Kahn. Considered today the connections that Henry made between colour and motion are still very contemporary.

[1] Henry, C. 1888. Cercle chromatique présentant tous les compléments et toutes les harmonies de couleurs avec une introduction sur la théorie générale du contraste, du rythme et de la mesure. Paris: Verdun.

[2] Henry, C. 1889. [Cercle chromatique.] Éléments d’une théorie générale de la dynamogénie autrement dit du contraste, du rythme et de la mesure avec applications spéciales aux sensations visuelle et auditive. Paris: Verdun.

[3] Rosenstiehl, A. 1913. Traité de la couleur au point de vue physique, physiologique et esthétique, comprenant l'exposé de l'état actuel de la question de l'harmonie des couleurs. Paris: H. Dunod et E. Pinat.

[4] Chevreul, M.-E. 1864. De l'abstraction considérée relativement aux beaux-arts et à la littérature. Forth part of ″De l'abstraction considérée comme élément des connaissances humaines dans la recherche de la vérité absolue“. Dijon: J.-E. Rabutot.

[5] von Helmholtz, H. 1867/1989. Optique physiologique. Translation by Emile Javal and N. Th. Klein, Paris: Gabay.

There's More to Life than Colour: The importance of visual appearance in characterising the visual world
[oral presentation]

David **Simmons**, University of Glasgow, UK

Colour is undoubtedly an important visual property to consider when trying to characterise the materials that make up our visual world (Kingdom, 2011). However, when we think of complex stimuli such as hair, soil, water and fire we rely on much more than just colour information to make judgements. The nascent field of *visual appearance measurement* (CIE, 2006) aims to consider all the relevant variables that go into making these judgements. So far, the field has concentrated on adding measurements of gloss, translucency and texture to colour, but other relevant aspects when considering, for example, textiles, are 3D structure and relative motion.

I shall draw on medical imaging applications to illustrate how colour measurement is only part of the answer to characterising visual materials. In particular, my work on the simulation of dental fluorosis (white spots on the teeth caused by the ingestion of too much fluoride in childhood) and the measurement of the severity of post-surgical facial scarring demonstrate that visual texture and 3D surface microstructure contribute strongly to ecologically valid visual judgements of both the nature of, and the aesthetic response to, visible surfaces. Another outcome of this work is that, as in colour studies, by investigating the language used to describe visual appearance we can guide our understanding of how appearance is characterised by the human visual system. This, in turn, leads to the suggestion of a new area of semantics research which can arise in parallel with colour studies research: namely *visual appearance studies*. I shall put forward a framework for how this new field should progress.

CIE 175:2006 *A framework for the measurement of visual appearance*. CIE: Vienna, Austria.
Kingdom, F.A.A. (2011). Illusions of colour and shadow. In *New Directions in Colour Studies* (Eds. Biggam, Hough, Kay & Simmons). Benjamins: Amsterdam.

Axiological Aspects of the Polish and Russian Colour Lexicons
[oral presentation]

Danuta **Stanulewicz**, University of Gdańsk, Poland, Ewa **Komorowska**, University of Szczecin, Poland, and Adam **Pawłowski**, University of Wrocław, Poland

The aim of this paper is to investigate and compare the axiological attributes of colour terms found in Polish and Russian. Two possible outcomes of the study are possible. Both languages may display similar characteristics, as they are genetically related, spoken in neighbouring countries and influencing each other for centuries. However, colour connotations belong to the group of "culture motivated" language features and some differences are also likely to appear.

The first part of the paper presents the results of two questionnaires investigating positive,

negative and neutral values associated with the eleven Polish and twelve Russian basic colour terms. In the first questionnaire 50 Polish and 50 Russian speakers were asked to mark the type of associations – positive, neutral or negative. The other questionnaire elicited from the respondents positive, neutral and negative associations evoked by particular colours. The results – which is not surprising – point to the colours which are considered optimistic, pessimistic and neutral, Moreover, they point to apparently contradictory phenomena, Firstly, one association may happen to be classified in three ways, e.g. the mouse associated with grey is perceived as positive, neutral or negative, depending on the speakers' preferences. Secondly, one association may be provided for two colours which are considered opposite, e.g. death is given by numerous respondents as a negative association with both black and white.

The second part of the paper contains a contrastive corpus study of the examined colour collocations with colour terms. Its aim is to investigate whether the results obtained in the questionnaires are corroborated by the results of the corpus study, that is whether the axiological values elicited from the Polish and Russian speakers are reflected in corpora of these languages.

Reconstruction of the history of the basic colour terms revisited
[oral presentation]

Urmas **Sutrop**, Institute of the Estonian Language, Tallinn, Estonia

Berlin and Kay not only considered the evolutionary sequences of the colour vocabulary's development stages, but they also gave some guidelines for linguistic reconstruction of the basic colour terms in a language (1969: 36-41). For reconstructing the history of the BCTs these guidelines must be considered in combination with the original criteria of basicness. Fox (1995: 18) has pointed out that the lexical categories of BCTs (slots in the system) and not the lexical items themselves must be preserved when a language moves to a more elaborate stage.

The development of the BCTs research has shown that there are more composite colour categories than the original *grue* proposed by Berlin and Kay (1969). The powerful tool for the historical reconstructions of the BCTs is the Composite Category Rule (Kay, Berlin, and Merrifield 1991: 16) that sets an empirical limit of 9 on the 63 logically possible composite categories of black, white, red, yellow, green, and blue.

In the reconstruction of the BCTs in a language family we should start from the language family tree structure. The depth of a language family tree shows the nodes between the proto-family and a modern language; the width shows the number of nodes, i.e. sub-groups in concrete time. A serious problem arises when we abandon the traditional tree models and/or replace them with a bush model. As a result the nodes between the modern languages and proto-family are absent.

This paper attempts to revise the principles of the historical reconstruction of the BCTs and reconstruct the BCTs in the Uralic language family. Finally, the implicative distributional restrictions of colour terms (*if a language contains* x *terms, then it contains a term/terms for* y) will be revised in agreement with the findings from the Uralic family.

Berlin, Brent & Paul Kay. 1969. *Basic Color Terms: Their universality and evolution.* Berkeley and Los Angeles: University of California Press.
Fox, Anthony (1995) *Linguistic Reconstruction: An introduction to theory and method.* Oxford University Press.
Kay, Paul, Brent Berlin & William Merrifield. 1991. "Biocultural Implications of Systems of Color Naming". *Journal of Linguistic Anthropology* 1: 1.12-25.

From Blood to 'Worms': Semantic evolution of a Portuguese colour term
[oral presentation]

Andrew **Swearingen**, Lisbon, Portugal

This paper examines the historical and cognitive processes involved in the semantic change of a Portuguese colour term framed within the context of Berlin & Kay's (1969) theory of colour term evolution and cognitive semantics (Taylor 1995). The historical record provides evidence of an apparent semantic shift involving the Portuguese colour term *roxo*, whereby its referent, initially designating the colour RED, came to designate the colour PURPLE. Drawing principally on colour research and prototype theory, I argue that such a process was set in motion by an adjacent semantic shift in the colour term *vermelho* from non-basic to the basic colour term for RED in Portuguese. Supported by empirical evidence from historical texts, I document an overall timeline for this change and suggest that extra-linguistic factors involving the dyeing industry in Iberia serve as the motivation for these shifts. This view is further supported by evidence from colour term cognates of other Ibero-Romance varieties such as Catalan and Galician. The history of Portuguese *roxo* and *vermelho* further contributes to research on the cross-linguistic existence of universal colour foci (best examples) versus category boundaries.

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Terry Regier, T., P. Kay and R. S. Cook. (2005). 'Focal colors are universal after all'. Proceedings of the National Academy of Sciences 102: 23, 8386-8391. PDF preprint.
Swearingen, A. (2002). *Seeing Red in 'Roxo': Evolution of a Portuguese Colour Term.* Unpublished MA thesis, University of Copenhagen.
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The Relationship between Colour-Object Associations and Colour Preference: Further investigation of Ecological Valence Theory
[oral presentation]

Chloe **Taylor**, Alexandra **Clifford** and Anna **Franklin**, University of Surrey, UK

Ecological Valence Theory (EVT; Palmer & Schloss, 2010) proposes that colour preference is influenced by colour-object associations, i.e. people like colours they associate with liked objects and dislike colours they associate with disliked objects. Palmer and Schloss found that the average valence of colour-object associations (weighted by how well the objects matched the

colours: WAVE) explained 80% of the variation in American colour preference. Here, we further investigate EVT and whether the valence of colour-object associations can account for sex differences in colour preference. Separate groups of participants completed four tasks: colour preference rating (N=42), object description (N=55), colour-object match rating (N=38) and object valence rating (N=40). Stimuli were 24 colours based on the 'light', 'dark' and 'saturated' sets used in Palmer and Schloss. The WAVE, calculated separately for males and females, accounted for significantly more variance in male colour preference (74%) than female colour preference (45%). This suggests that EVT is a poor predictor of female colour preference, at least for the types of colour-object associations measured here. Furthermore, analyses revealed a negative relationship between the number of objects associated with a colour and how much the colour is preferred; colours associated with fewer objects were liked more than colours associated with many objects. This relationship greatly enhanced the effectiveness of the WAVE at explaining variance colour preference. This therefore indicates that aspects of colour-object associations other than valence are related to preference. We also present preliminary data from a study of colour preference with the Himba (a semi-nomadic tribe in rural Namibia) that identifies a negative relationship between the valence of colour-associated objects and colour preference for Himba males. Overall, the findings provide broad support for the notion that colour preference is related to colour-object associations, but also identifies several constraints of EVT in its current form.

Presence and Colour
[oral presentation]

†Tom **Troscianko**, University of Bristol, UK, Stephen **Hinde**, University of Bristol, UK, and Ian **Moorhead**, Sci-Vision Ltd

We are interested in evaluating the contribution that colour makes to movies, magazines, and other immersive media. Colour science can provide rich detail about the composition of such scenes, but tells us little about what benefit arises from the addition of colour to an otherwise b&w display.

We have developed a simple technique which measures the subjective degree of "presence" or immersion in media, in real time. We apply this at regular intervals during a movie, or while reading text. In a series of early studies we investigated the effect of altering the size of a movie screen on such measures, and showed that the subjective measures are repeatable, sensitive to display parameters, and correlate with measures of arousal such as pupil diameter.

We have applied this measure in two studies in which colour is added to an otherwise b&w display. In each case we tested two groups of participants: one group saw only the b&w displays, while the other saw the colour displays. Subjective measures of presence were obtained at approximately one-minute intervals. The first study compared b&w and coloured versions of the movie "The Good, The Bad, and The Ugly" (Sergio Leone, 1966). Results indicated that colour had a positive effect on presence only when presence was low, and a negative effect when presence was high.

The second study involved reading b&w printed text in articles taken from popular magazines

such as “Cosmopolitan” and “Guardian Weekend”, in which the associated photos and graphics were either b&w or colour. As in the movie study, a positive contribution of colour was found when rated presence was low, reducing to zero when presence was high.

The findings suggest that measuring subjective presence can provide a rich description of the benefit of having a colour, as opposed to a b&w, display. The data also indicate which aspects of stories are more immersive than others, and how this variability in immersivity interacts with display parameters.

Linguistic categorisation of blue in some Indo-European and Finno-Ugric languages
[oral presentation]

Mari **Uusküla**, Institute of the Estonian Language, Tallinn, Estonia

In most languages, one colour category is represented by one linguistically simple colour term, as predicted by Berlin and Kay’s theory. However, some languages seem to describe one category with two (or more) words. Present research on basic colour terms supports the existence of more than 11 basic categories in some languages (Paramei 2007 “Russian ‘blues’: controversies of basicness”; and Paggetti & Menegaz 2010 “Is the light blue (*azzurro*) color name universal in the Italian language?”). This phenomenon has been noted in Russian, Modern Greek, Maltese, Italian, Turkish and Catalan. The category of blue has been linguistically and psychologically split into two concepts, described by two basic colour terms in some languages.

The study represents a case of two BCTs for blue found in Standard Italian (Romance, Indo-European), Lithuanian (Baltic, Indo-European) and Udmurt (Permic, Finno-Ugric). The data has been gathered 1) in the field by using the field method of Davies and Corbett (1994), i.e. a list and colour-naming task, a free-sorting task with 55 colour samples of a 314 Coloraid set, and a collocation-association task, and 2) drawn from dictionaries and corpuses. The results make it possible to conclude the following: Standard Italian has (at least) 2 BCTs for blue: *blu* ‘dark blue’ and another colour term for lighter blue, either *azzurro* or *celeste* depending on the local speech tradition; both Lithuanian and Udmurt have 2 BCTs for blue: *mėlyna* ‘blue’ and *žydra* ‘light blue’ in Lithuanian, and *lyz* ‘blue’ and *čagyr* ‘light blue’ in Udmurt.

The findings are in accordance with previous studies in which two different linguistic terms represent one colour category. The colours are split according to the lightness-darkness scale, similar to other languages with such a division.

Pictorial Almodóvar and Creative Use of Color in Cinema
[oral presentation]

Eduardo **Urios-Aparisi**, University of Connecticut, USA

Color is a resource of Almodóvar's cinematic style (cf. Allinson 2001 and D'Lugo 2006). This paper studies how the film maker's use of color represents characters' emotional states and actions, and is part of Almodóvar's worldview. I study single colors such as red (*Matador* 1986), green (*Talk to her* 2000) and color patterns like light blue and orange (*Tie me up! Tie me down!* 1990), red and white (*Matador* 1986) or red and blue (*Dark Habits* 1983, *Labyrinth of passion* 1982, *Talk to her* 2002).

Color in cinema is to be understood as a three-way property: the experience of color (intensity or saturation, lightness, temperature, and contrast), the material elements of the mise-en-scène and its presence or absence in connection to other films, and particularly to certain genres and signature styles of some directors. According to the meaning making processes defined by Conceptual Metaphor Theory (Lakoff and Johnson 1980, 1999), color can be considered a property of images whose underlying image schema is the Container Schema (cf. Branigan 2005). As a Container, color is a space with an inside, an outside, and a boundary. Color involves shapes, the material elements to which it is associated, and other colors and color patterns.

Almodóvar's creative use of color is the result of sensorimotor experiences and culture. The influence of the genre is particularly important in Almodóvar. His cinema is characterized by its artificiality and by the emotions he wants to arouse. Color is a property connected to the objects it inhabits. Via the reduction or expansion of color schemes and effective use of lighting, mise-en-scène and costumes, Almodóvar creates patterns with figurative meanings.

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A Window to the Past: Does adult ornamental plumage reveal early life environments?
[oral presentation]

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Having a good start in life can have important downstream effects on adults. Neonatal development in humans has well-documented implications for health in adult life, and similar effects on life-history traits are seen across the animal kingdom. For example, early life environment can have repercussions for the development of colourful sexual ornaments in birds, and consequently for an individual's fitness. Pigment-based colours and structural colours can act as multiple ornaments, and some colourful ornaments may signal the neonatal

environment in which an individual was reared. Studies considering nestling environment and plumage colour have tended to focus on the short-term effects on nestling colour, or on non-plumage based ornaments, and not on the long-term effects on adult ornamental feather colouration. The aim of this study was to experimentally investigate the downstream effects of neonatal diet on male breeding plumage in the New Zealand hihi. In this species males express melanin-pigmented black head, back and breast, carotenoid-pigmented yellow shoulders and wings, and structurally produced white ear tufts. In a supplementation experiment nestlings were provided with different nutritional and carotenoid treatments and, following the post-juvenile moult, male breeding plumage in the three colourful regions was quantified. We found that carotenoid-based yellow and melanin-based black in first-year plumage was not affected by nutritional or carotenoid treatments, while luminance of white ear tufts was influenced by nutritional supplementation. Our results indicate that colourful breeding plumage produced by different mechanisms can reveal different information about an individual's rearing environment.

Basic Colour Terms and the Environment. A comparative corpus study of Polish *zielony* and English *green*

[oral presentation]

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Over the years various changes have caused the Basic Colour Terms (BCTs) *green* and *zielony* to develop new senses that have been conventionalised in English and Polish respectively. One such meaning that has gained much attention in recent years is the use of *green* and *zielony* to mean 'ecological, environmentally friendly'. Does this use affect the basicness of these colour terms? Berlin and Kay's (1969) work on colour, where not only a theory of universals in the domain of colour terminology was presented, but also criteria for distinguishing basic from non-basic colour terms established, has continued to be tested in various field studies. Since then, there have been a few attempts to modify the basicness criteria (e.g. Moss 1989). The question of loss of basicness by a colour term was raised by Berlin and Kay in their original report but has hardly ever been explored (though see Forbes 1979). The present study aims to explore the issue of how the polysemy of Basic Colour Terms *green* and *zielony* affects their basicness, by paying particular attention to the sense of the environment and ecology. These issues will be explored using data from Polish and English corpora: the National Corpus of Polish (http://nkjp.pl); the British National Corpus (http://corpora.byu.edu/bnc) and the Corpus of Contemporary American English (http://corpora.byu.edu/coca).

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No Categorical Appearance of Equally Discriminable Colours

[oral presentation]

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Testing categorical effects for colour requires controlling perceptual distances of the respective colour pairs. Most studies have determined perceptual equidistance with the Munsell system, and sometimes also with CIELAB or CIELUV colour space. However, perceptual equidistance is only very, very coarse in these spaces. In fact, when measuring discrimination thresholds for the typical colour pairs used in previous studies we found that colour differences were even biased towards the pattern of the category effect. In order to solve this problem we equated perceptual differences in terms of discriminability. In a previous study, we found category effects on reaction times for these equally discriminable colour pairs. This, however, was only the case when observers were untrained and yielded high reaction times as compared to the trained observers. Here, we used the same colour pairs and tested for categorical effects on the subjective appearance of difference. We employed a triad task and a new kind of adjustment task. In contrast to former studies that used the biased Munsell colours, we did not find any category effect on the subjective appearance of distance. In fact, our observers estimated perceptual differences very precisely compared to discrimination thresholds. We conclude that observers do recur to the unbiased perceptual information if it serves the accomplishment of the task.

Influences of Stimulus Categorization on Asymmetries in Target Detection and Visual Search Tasks Involving Colorful Stimuli

[oral presentation]

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Two phenomena associated with visual search tasks are category effects and search asymmetries. In search tasks, a category effect is demonstrated when performance is better on trials where target and distracters are categorized using different terms (across-category) than on trials where target and distracters are categorized using the same term (within-category). Asymmetries in visual search occur when searches for stimulus A among stimulus B produces different results from searches for B among A (see Wolfe, 2001, for review).

Experiment 1, reported here, used visual search and target detection tasks of a kind often used to provide evidence for color category effects. In addition to the across-category advantage reported in previous studies (e.g., Franklin, Pilling, Davies, 2005; Gilbert, Regier, Kay & Ivry, 2006), asymmetries in performance of within-category trials were found: on such trials performance was better when targets were located closer to the category boundary than the backgrounds/distracters. Experiment 2 investigated whether reversing target and background/distracters produces changes in the categorical relationship between stimuli. Results indicate that such reversals produce changes in categorization of within-category trials. Interestingly, these changes in categorization covary with the asymmetries noted in Experiment 1, suggesting within-category asymmetries in search tasks involving colourful stimuli may represent a kind category effect, one not previously reported.

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Blue-Green Colour Categorisation in Mandarin-English Speakers

[poster presentation]

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Background: Observers are faster to detect a target among a set of distracters if the targets and distracters come from different color categories. There is controversial evidence that this cross-boundary advantage is limited to the right visual field, which is consistent with the dominance of the left hemisphere for language processing.

Purpose: Here we study whether a similar visual field advantage is found in the color identification task in speakers of Mandarin, a language that uses a logographic system. Forty late Mandarin–English bilinguals performed a blue–green color categorization task, in a blocked design, in their first language (L1: Mandarin) or second language (L2: English). Eleven color singletons ranging from blue to green were presented for 160 ms, randomly in the left visual field (LVF) or right visual field (RVF). Color boundary and reaction times (RTs) at the color boundary were estimated in L1 and L2, for both visual fields.

Results: We found that the color boundary did not differ between the languages; RTs at the color boundary, however, were on average more than 100 ms shorter in the English compared to the Mandarin sessions, but only when the stimuli were presented in the RVF. The finding may be explained by the script nature of the two languages: Mandarin logographic characters are analyzed visuospatially in the right hemisphere, which conceivably facilitates identification of color presented to the LVF.
